

12.0 COST MODELS

12.1 Introduction

This chapter introduces the concept of cost models in general terms and describes considerations for the utilization of a model. A few specific hardware cost models are presented as examples; however, they are not intended to constitute a complete list, but only to identify some of the more frequently used models which are considered representative of the capabilities available. Cost estimating models are discussed in other areas of this handbook. Section 8.4 of Chapter 8, “Cost Risk and Uncertainty,” describes two models used for cost estimate risk analysis. Section 13.5 of Chapter 13, “Operation and Support Cost Estimates,” describes the types of O&S cost models and provides an overview of some selected models.

12.2 Categories

This chapter will discuss two general categories of models: cost accounting models and CER models. Both manual and automated methods are available, although the use of automated methods is pervasive even with simpler models today.

12.3 Examples of Hardware Cost Models

The following sections describe three popular cost hardware models in use today. Since there are few commercial hardware cost models available, the two most widely used are discussed in general terms in this section without creating a separate appendix. DoD and NASA have developed many special application hardware cost models (e.g., space launch vehicles), however, those models/CERs applicable to the FAA generally are contained in DoD’s ACEIT tool, discussed in Section 12.3.3. Section 13.5 of Chapter 13 identifies a number of O&M cost models.

12.3.1 PRICE Cost Models

Key inputs to the PRICE H Model are:

- **Weight:** tells the model the size of the product being estimated.
- **Manufacturing complexity:** a coded value that characterizes product and process technologies and (optionally) the past performance of the organization.
- **Platform:** a coded value that characterizes the quality, specification level, and reliability requirements of the product application.
- **Quantities:** the number of prototypes and production items to be estimated.
- **Schedule:** the dates for the start and completion of the development and production phases may be specified. The model will compute any dates that are not specified. Only the date for the start of development is required.

Cost Models

- Development costs: effort associated with drafting, design engineering, systems engineering, project management, data, prototype manufacturing, prototype tooling, and test equipment.
- Production costs: effort associated with drafting, design engineering, project management, data, production tooling, manufacturing, and test equipment.

12.3.2 SEER Cost Models

The System Evaluation and Estimation of Resources (SEER) models are used to estimate development, production, and operating/support costs of hardware, software, and integrated circuit programs. The SEER estimating models were developed by GA SEER Technologies as a computerized system for producing life cycle cost estimates and schedules for acquisition programs involving a wide variety of hardware and software content. The models estimating capability is derived from parametric equations, produced by cost analysis of previous programs, and a knowledge base of cost data that aids the analyst in producing estimates of programs in the concept phases where detailed data is not always available.

Hardware Cost Estimating Model (SEER-H)

The SEER family of models includes the basic hardware cost estimation model (SEER-H) and a hardware life cycle cost model. The hardware cost model estimates hardware cost and schedules and includes a tool for risk analysis. The hardware model is sensitive to differences in hardware technologies ASIC, MCMS, exotic materials, miniaturization, etc., and to different acquisition scenarios (e.g., make, modify, customer-furnished, purchased, off-the-shelf, etc.). It is also sensitive to differences in electronic versus mechanical parameters and makes estimates based on each hardware item's unique design characteristics.

Key inputs to SEER-H are weight, volume, material composition, complexity of form/fit, production process, electronic parameters, mission description and quantity/schedule.

12.3.3 Automated Cost Estimating Integrated Tools (ACEIT)

ACEIT is an estimating system consisting of a suite of tools designed to assist cost analysts in arriving at cost estimates, conducting what-if? studies, developing cost proposals and evaluations, conducting risk and uncertainty analysis, and developing cost estimating relationships (CERs). Its primary purpose is financial management. Although ACEIT can be set up to estimate any type of program (hardware, software, O&S, etc.), it has been primarily used to estimate hardware programs. ACEIT is a Joint Service system, sponsored by the Air Force Materiel Command (AFMC) Electronic Systems Center and the U.S. Army Cost and Economic Analysis Center (CEAC). The result of government-sponsored efforts, the ACEIT suite of applications is available to U.S. government organizations with no charge for use (but there is an annual maintenance and support fee). The ACEIT system is a computer based cost model that allows the estimator to start from the ground up with the WBS elements. The system enables the estimator to define the estimate, build the estimate, and to document the estimate using either built in methodologies or one of their own. This is a combination accounting model and CER

model. For government users, a CER database is provided to aid the estimator in developing his or her model.

12.4 Summary

The goal of this chapter was to outline the concept of cost models. Accordingly, cost models were defined. CER and cost accounting models are the most common categories of models. There are several models available within each category. Section 12.3 of this chapter described three hardware cost models. Chapter 13 contains examples of operating and support (O&S) cost models. Models are very useful; however, calibration and validation of the model being used is necessary. The estimator can use models to simplify greatly a complex estimating task, provided the estimator is careful in choice of model and understands the model composition and the data input required. In short, a cost model is a tool - the estimating process remains the same.